# Fort Keogh Researcher

USDA-ARS

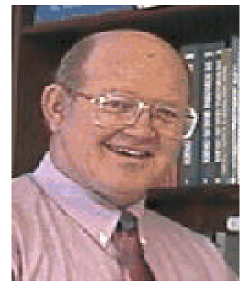
Livestock and Range Research Laboratory



*Inside this issue:*



Since the publication of our last *Fort Keogh Researcher,* a number of exciting and not-so-exciting events have or are happening. First and foremost is our up-coming **Open House and Groundbreaking Ceremony** scheduled for the early evening of August 9. Educational tours of our current facilities and associated research projects will begin at 4:00 p.m. and continue until all attendees have had an opportunity to participate. At 6:00 p.m., we will begin the formal Groundbreaking Ceremonies for the two additions that will be added to our current office/laboratory building. One addition will be for 3 new laboratories, a greenhouse, and associated offices. The second will be an educational center to facilitate our ability to host and conduct educational/technology transfer events. Dr. Edward Knipling, ARS Administrator, and many of his staff will be present for the ceremonies as well as Dr. Sharon Quisenberry, Dean of Agriculture, Montana State University, and associated members of the MSU staff. We also anticipate that at least one of our U.S. Senators will be present as well as Representative Dennis Rehberg. In addition, all State and local dignitaries and their staffs have been invited to attend the ceremonies. And one of the best events is the **free barbecue** that will be served following the ceremonies with background entertainment provided by a live bluegrass band with close ties to the Fort Keogh staff! So, come out and join the Fort Keogh staff for a fun and entertaining evening.



*Rod Heitschmidt, Research Leader and Range Ecologist*

Now a not-so-happy event. **Dr. Rick Funston**, Montana State University Beef Extension Specialist at Fort Keogh, has accepted a similar position at the University of Nebraska's North Platte Research/Extension Center. His last day of work at Fort Keogh is July 26. Our hope is to fill the position in the not too distant future. Rick has been a most positive addition to the Fort Keogh staff and he will be sorely missed by Fort Keogh as well as the eastern Montana beef cattle industry. We wish Rick well.

Also, our Administrative Officer, **Phil Dailey**, has accepted a promotion and new position in the ARS Northern Plains Area office


*(Continued on page 3)*


**Our Vision**:

A world-renowned research program that provides knowledge relevant to efficiently producing nutritious and palatable beef from rangeland based livestock production systems.

**Our Mission:**

To develop ecologically and economically sustainable range livestock production systems that meet consumers' expectations.


• July 2002

# Do You Have to Run Out of Forage Before You Manage?

Rod Heitschmidt,
Research Leader & Superintendent

**Introduction**

A fundamental challenge in the range livestock industry is the timely implementation of drought management strategies. Although many producers have a drought management plan, implementation of said plan is often reactive rather than proactive. No doubt, the reasons for this vary. For example, full participation in government funded drought management programs is often dependent on adoption of reactive rather than proactive management strategies. But in my opinion, the most fundamental reason is that ranchers and farmers are eternal optimists relative to up-coming precipitation events. They know, as we all do, that precipitation is "on its way." But their optimism is bolstered by the flawed fundamental belief that said precipitation event is going to occur in the very near future and it will significantly reduce, if not entirely eliminate, all drought related problems.

This problem is further compounded by our inability to accurately forecast "significant" precipitation events beyond a few hours or days. Still, there are certain drought driven realities that we tend to disregard or at least not fully appreciate. For example, it is well known that drought is an inherent trait of arid and semi-arid rangeland ecosystems for if that were not so, most would be forests. We also know that even in the best of times, we are within 2-3 weeks of being in a drought situation. We also know the odds of getting "significant" precipitation and the effects of said events on forage growth and productivity vary broadly over time.

Still, arid and semi-arid rangeland agriculturalists (i.e., graziers) often fail to fully appreciate these realities, and the question becomes - why? Again, I would argue it is largely because they are necessarily eternal optimists when considering up-coming precipitation events for if this were not so, how could an arid or semi-arid grazier enjoy life? But perhaps it is also because rangeland agriculture researchers and extension specialists have also focused on the development of reactive rather than proactive drought management strategies. The objective of this paper is to outline a rather simple, yet I believe effective means for dealing with drought in a proactive manner. I will do this by posing and then answering a series of questions.

**Questions & Answers**

**1. What is the relationship between monthly precipitation values (i.e., if precipitation is below average one month, what is the probability that it will be below average the next month?)?**

The underlying rationale for posing this question was based on the assumption that there is a positive relationship between weather conditions on consecutive days. So, if true on a daily basis, could it also be true on a weekly or monthly basis. Using 106 years of monthly precipitation data from Miles City, we found four significant ($P<0.05$), positive, between months correlations (i.e., Jan. vs. Feb., Sept., and Dec., and Feb. vs. Nov.). However, although these correlations may make some meteorological sense, their value was minuscule with the maximum $R^2$ value being 0.08 for the Feb. vs. Nov. relationship.

We also examined bi- and tri-monthly (i.e., seasonal) relationships. Again, we found several significant, positive relationships but none that explained more than 8% of between month variation.

Conclusion: Don't expect to learn much of anything about next month's precipitation based on current month's.

**2. What is the relationship between monthly and annual precipitation (i.e., if it is dry in any given month, is it going to be a dry year?)?**

Again, using the 106 year data set, we found eight months' precipitation values were significantly ($P<0.01$) correlated with total annual precipitation. Months with greatest $r^2$ values were June, May, September and April with values of 0.30, 0.25, 0.16, and 0.15, respectively. These relationships were not unexpected as April, May, June, and September are the four months of greatest precipitation at Miles City. Similarly, we also evaluated bi- and tri-monthly relationships and found strong relationships between total May/June precipitation and annual precipitation ($r^2 = 0.52$) and total April/May/June precipitation and annual precipitation ($r^2 = 0.62$).

Conclusion: If spring precipitation is below normal, expect total annual precipitation to be below normal and vice versa.

**3. What is the relationship between monthly precipitation and annual forage production?**

Rosie Kruse, a Montana State University graduate student working with Dr. Mike Tess and myself, addressed this issue by simulating forage production at Fort Keogh relative to monthly precipitation values and maximum and minimum temperature. Study results revealed highly significant ($P<0.01$) correlations between annual forage production and April ($r^2 = 0.37$), May ($r^2 = 0.29$), December ($r^2 = 0.24$), total April/May ($r^2 = 0.66$), total May/June ($r^2 = 0.26$), total April/May/June ($r^2 = 0.56$), and total April/May/June/July ($r^2 = 0.47$) precipitation as well as total annual precipitation ($r^2 = 0.36$). Stepwise regression procedures were then used to develop a "best fit" growing year (i.e., August through July) forage production model. The model incorporated monthly precipitation values for April, May, October, and November and resulted in an $r^2$ value of 0.83.

Conclusion: Spring precipitation, particularly April and May, is the primary factor affecting annual forage production at the Fort Keogh Livestock and Range Research Laboratory (LARRL).

**4. What is the primary rangeland forage growing season at LARRL?**

To address this issue we examined the temporal dynamics of perennial grass production at LARRL across 10 years of ambient climatic conditions and three years of field rainout shelter imposed drought conditions (i.e., two years of imposed spring drought and one year of late spring to early fall drought). But rather than simply address the absolute dynamics of perennial grass production, we addressed the relative dynamics as expressed by the percentage of annual production completed by May 1, June 1, and July 1. Results showed that most perennial grass production was completed by July 1 averaging 91% (S.D. = 10, range = 71 - 100%) for perennial cool-season grasses, 76% (S.D. = 20, range = 38 - 94%) for perennial warm-season grasses, and 91% (S.D. = 12, range = 63 - 100%) for total perennial grasses.

Conclusion: In 2 out of every 3 years, at least 79% of annual perennial grass production will be completed by July 1, and in 19 out of 20 years at least 65% of annual perennial grass production will be completed by July 1.

**A Simple Decision Support System**

Based on the above findings, I believe Northern Great Plain's graziers should be able to implement effective drought management strategies with considerable confidence by early summer because: 1) they know that total production is largely a function of springtime precipitation; and 2) most production is completed by July 1. So, by incorporating knowledge of the amount of springtime precipitation, relative to the long-term average, and visual assessment of July 1 perennial grass standing herbage, they can begin to adjust forage demand (i.e., stocking rates) long before they deplete their entire forage base.

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in Fort Collins. Our goal is to fill this position by late fall as this position is key administrative position at Fort Keogh staff. We wish Phil and his family the very best.

On a happier note, we have hired **Dr. Lance Vermiere** as an ARS Rangeland Scientist. Lance is a native Oklahoman and is a recent Ph.D. graduate of Texas Tech University. He is largely a field ecologist interested in how livestock grazing affects the ecological condition of rangelands, wildlife populations, etc. and the potential role that fire plays in altering response patterns.

Hope to see you at the Open House/Groundbreaking ceremonies, Friday, August 9.

# A Tidbit of History

## Yellowstone River Bridge 1902 - 2002

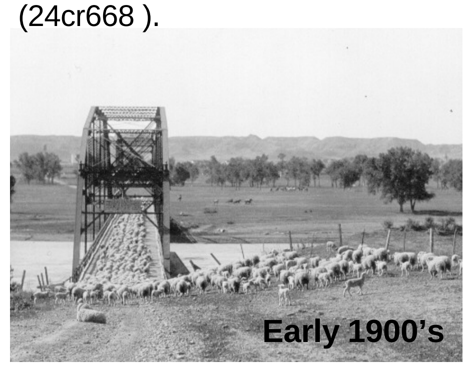
**By Cheryl Murphy**

**Range Technician**

The Yellowstone River Bridge was constructed in 1902, just northeast of Fort Keogh , at a cost of $40,000.00 by W.S. Hewett and Company of Minneapolis, MN. William Sherman Hewett was born in Hope, Maine on October 27, 1864. In March of 1887 at the age of 23, he moved to Minneapolis to work in the company of his uncle, Seth Maurice Hewett, a bridge builder. Young William gained his technical education working for his uncle who built several bridges in Montana. In 1897 at the age of 33, William formed his own company, the William S. Hewett Bridge Company headquartered in Minneapolis, Minnesota. His company built numerous steel bridges throughout Minnesota, the Dakotas and Montana. During the homestead era there was a great deal of agricultural development along the Yellowstone River. As a Result, ten bridges were built across the Yellowstone River between Billings and Glendive during the years 1902-1915. All of these structures were erected by either William S. Hewett or the Security Bridge Company and all but one were multi-span, pin-connected Pennsylvania through truss bridges. The First of these ten Bridges was the



1902 Fort Keogh Bridge constructed by William S. Hewett and Company. It Is the only one of the pin-connected Pennsylvania truss bridge remaining intact. This design was used frequently for long spans throughout Montana in the early 20th Century. The bridge has two main spans, each 310 feet long, with several approach spans. The bridge serves local vehicle traffic and cattle movement between pastures. In 1924, when the Fort Keogh Military Fort was acquired by the U.S. Department of Agriculture, the Yellowstone River Bridge was bought from the State of Montana by the U.S.D.A. for one dollar. The Yellowstone River Bridge is on the National Register of Historic Places and is assigned the Smithsonian Site Number (24cr668 ).



# The relationship between production and milk EPD

**M.D. MacNeil**
**Quantitative Geneticist**

Influential breeders sometimes express the opinion that "EPDs are not accurate enough for us to use as a selection tool." Even more often someone will ask, "Does the milk EPD really predict differences in milk production?" It seems straightforward to analyze data for traits like birth weight or ribeye area that can be measured directly and obtain the resulting EPD. However, the milk EPD is more difficult to grasp. Clearly, only on very rare occasions, as in a research setting, is milk production of beef cows measured directly. Rather than relying on measured milk production, the milk EPD results from dividing observed weaning weight into components due to the calf expressing its growth potential and its dam creating a favorable environment (milk) for growth. This complex process creates an innate distrust of the resulting milk EPD. Therefore, the objective of the research reported here was to determine if differences in measured milk production were associated with the milk EPD.

Milk production can be measured in beef cattle using the weigh-suckle-weigh technique. In early afternoon, calves are separated from their dams. Later that evening they are returned to their dams and allowed to nurse. This nursing is to empty the cow's udder of milk. The calves are again separated from their dams and they remain apart for 12 hours. The next morning, the calves are weighed, reunited with their dams and allowed to nurse until no more milk is available, then quickly weighed again. The difference in each calf's weight before and after nursing is a measure of its dam's milk production.

In this research, milk production by Line 1 Hereford cows was measured four times during lactation. Characteristics of the calves at each time of measurement are shown in Table 1. The first measurement was taken shortly before the beginning of the breeding season and the last measurement was collected at weaning. There were records from 76 2-year-old cows, 83 3-year-old cows, 59 4-year-old cows, and 113 5-year-old and older cows.

A mathematical model of a lactation curve was fit to the resulting milk production records. The milk EPD was added to this general model, thus allowing different lactation curves for cows with different milk EPD.

Shown in Table 2 are estimates of peak and total milk yields for various levels of milk EPD. The milk EPD themselves reflect differences in weaning weight of calves that presumably result from differences in milk production. Because several pounds of milk are required to produce a single pound increase in weight, differences in total milk production should be greater than differences in the milk EPD.

Other researchers have likewise found similar close relationships between the milk EPD and total milk yield. These results, that show a 1 pound change in milk EPD corresponding to a 24-pound change in total yield, are among the most conservative. Other estimates range upward to slightly more than twice these and extend the relationship of milk EPD with milk production to additional breeds besides Hereford.

In conclusion, a close relationship between milk EPD and actual milk production does exist. Selection of sires for increased milk EPD can be expected to increase milk production of resulting daughters. However, milk production is a trait for which maximum is not necessarily optimal. Whether an individual breeder should select for increased milk production depends on the particular situation. Too little milk production may compromise growth of the calves. Too much milk may add unnecessary feed costs or compromise reproductive efficiency of the cow herd.

**Table 1. Age and weight of Line 1 Hereford calves when weigh-suckle-weigh records of milk were collected.**

| | Age, days | | | Weight |
|---|---|---|---|---|
| **Measurement** | **Mean** | **Oldest** | **Youngest** | **pounds** |
| **1** | 52 | 87 | 9 | 179 |
| **2** | 93 | 132 | 53 | 250 |
| **3** | 137 | 180 | 93 | 332 |
| **4** | 180 | 215 | 137 | 399 |

**Table 2. Milk EPD, peak yield, and total milk production from mature Line 1 Hereford cows.**

| **Milk EPD** | **Peak yield, Pounds/day** | **Total yield, Pounds/lactation** |
|---|---|---|
| **-22** | 11.1 | 1537 |
| **-11** | 13.0 | 1806 |
| **0** | 15.0 | 2072 |
| **11** | 16.9 | 2341 |
| **22** | 18.8 | 2608 |

# Recent Publications

(for reprints email us at reprints@larrl.ars.usda.gov or call Mary Ellen French at 406-232-8224)


Blümmel, M., Short, R.E., and Grings, E.E. Comparison of elk (*Cervus elaphus*) fecal and rumen microbial suspension to predict feed degradation and adaptation. Proc. West. Sec. Am. Soc. Anim. Sci. 53:540-543. 2002.

Cronin, M.A., Patton, J.C., and MacNeil, M.D. Genetic variation in domestic reindeer and wild caribou (*Rangifer tarandus*). Proc. West. Sec. Am. Soc. Anim. Sci. 53:138-141. 2002.

Emmerich, W.E. and Heitschmidt, R.K. Drought and grazing: II. Effects on water yield and quality. J. Range Manage. 55:229-234. 2002.

Eneboe, E.J., Sowell, B.F., Heitschmidt, R.K., Karl, M.G. and Haferkamp, M.R. Drought and grazing: IV. Effects on blue grama and western wheatgrass tiller dynamics. J. Range Manage. 55:197-203. 2002.

Funston, R.N., Ansotegui, R.P., Lipsey, R.J., and Geary, T.W. Evaluation of melengestrol acetate/prostaglandin (MGA/PGF), Select synch, and 7 d MGA/Select Synch estrous synchronization protocols in beef heifers. Proc. West. Sec. Am. Soc. Anim. Sci. 53:405-406. 2002.

Funston, R.N., Paterson, J.A., Williams, K.E., and Roberts, A.J. Feeding and marketing cull cows. Proc. Montana Nutrition Conference: Realistic Solutions for Maintaining the Sustainability of Montana's Livestock Industry. p. 18-23. 2002.

Geary, T.W., Grings, E.E., MacNeil, M.D., and Keisler, D.H. Effects of feeding high linoleate safflower seeds prepartum on leptin concentration, weaning, and rebreeding performance of beef heifers. Proc. West. Sec. Am. Soc. Anim. Sci. 53:425-427. 2002.

Grings, E.E., Short, R.E., Geary, T.W., and MacNeil, M.D. Heifer development within three seasons of calving. Proc. West. Sec. Am. Soc. Anim. Sci. 53:261-264. 2002.

Grings, E.E., Heitschmidt, R.K., Short, R.E., and Haferkamp, M.R. Intensive-early stocking for yearling cattle in the Northern Great Plains. J. Range Manage. 55:135-138. 2002.

Heitschmidt, R. Do you have to run out of forage before you manage? Proc. Montana Nutrition Conference: Realistic Solutions for Maintaining the Sustainability of Montana's Livestock Industry. P. 3-5. 2002.

Heitschmidt, R.K., Johnson, J., and K.D. Klement. Science, Social Values and Livestock Grazing in the Great Plains. Great Plains Res. 11:361-374. 2002.

Kealey, C.G., MacNeil, M.D., and Golden, B.L. Genetic distance between a multibreed composite and two inbred lines of Hereford cattle. Proc. West. Sec. Am. Soc. Anim. Sci. 53:127-131. 2002.

Lawler, T.L., Taylor, J.B., Grings, E.E., Finley, J.W., and Caton, J.S. Selenium concentration and distribution in range forages from four locations in the Northern Great Plains. Proc. West. Sec. Amer. Soc. Anim. Sci. 53:7-9. 2002.

MacNeil, M.D. and Grosz, M.D. A genome-wide scan for QTL affecting carcass traits at constant fat depth in a Hereford x composite double backcross population. Proc. West. Sec. Am. Soc. Anim. Sci. 53:132-134. 2002.

Perry, G.A., Geary, T.W., Lucy, M.C., and Smith, M.F. Effect of follicle size at time of GnRH-induced ovulation on luteal function and fertility. Proc. West. Sec. Am. Soc. Anim. Sci. 53:45-48. 2002.

Roberts, A.J. and Jenkins, T.G. Effects of varying energy intake and sire breed on duration of postpartum anestrus, IGF-1 and GH in mature crossbred cows. Proc. West. Sec. Am. Soc. Anim. Sci. 53:454-456. 2002.

Short, R.E., MacNeil, M.D., Grosz, M.D., Gerrard, D.E., and Grings, E.E. Pleiotropic effects in Hereford, Limousin, and Piedmontese F2 crossbred calves of genes controlling muscularity including the Piedmontese myostatin allele. J. Anim. Sci. 80:1-11. 2002.


## Dr. Tom Geary Award Recipient

It is with pleasure that we announce that Dr. Tom Geary, Research Physiologist at Fort Keogh, recently received the prestigious Western Section Society of Animal Science's 2002 Young Scientist Award. Fort Keogh is very proud of Tom's research accomplishments and very pleased that his work is being recognized by his colleagues.

USDA-ARS Fort Keogh Livestock and Range Research Laboratory
In cooperation with Montana Agricultural Experiment Stations

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WE ARE ON THE WEB

http://www.larrl.ars.usda.gov

Feel free to pass on this issue of the Fort Keogh Researcher to others interested in agriculture and agricultural research. To be added to our mailing list, request a copy through our website or contact Diona Austill by phone (406-232-8200), fax (406-232-8209), or email (diona@larrl.ars.usda.gov)

# *Groundbreaking Ceremony August 9th*

*You're invited to an Open House and Groundbreaking Ceremony!*

*Friday, August 9, 2002—4:00 p.m.—Tours—6:00 p.m. Groundbreaking Ceremony—Barbecue to follow*

*At the Fort Keogh Livestock and Range Research Laboratory, West of Miles City*

*We're celebrating the start of a new era at Fort Keogh with building additions for a new technology transfer center and 3 new labs. So come take a tour and then stay for the groundbreaking ceremony and barbecue!*

*See you there!*